

After three years in the mill the students obtain a degree, gained under conditions calculated to minimise what should be one of the most important features in any university training: the learning to think and overcome difficulties for oneself. There is thus a growing annual output of graduates of both sexes who find, often too late, that their qualifications only fit them for one career: that of swelling the ranks of the already overcrowded and underpaid teaching profession. The production of a certain number of schoolmasters is a necessary element in the educational system of every country, but the question is: should this or the advancement of higher learning be the main function of a university endowed with public funds?

Many provincial colleges plead poverty as an excuse for overburdening their staffs with pedagogic and tutorial work. But these colleges are not too poor to vie with each other in the award of small scholarships, many of which go to pass students of no great ability. And experience, both in America and in this country, has shown that if only such objects as endowment of research are prominently brought before public notice, support will not be found wanting.

In conclusion, the directions where reform is most needed include the following:—

(1) Discontinuance of matriculation preparation—work which naturally belongs to the province of schools and crammers.

(2) Recognition of research work rather than tutorial instruction of pass candidates as the main duty of a professor outside his class-room.

(3) Reduction of the hours of class work, both of teachers and students.

(4) Revision of the now precarious conditions under which provincial appointments are tenable.

(5) Attraction of public attention to the importance of providing facilities for professorial research.

(6) The appointment of more and better paid assistant-lecturers and demonstrators.

(7) A more judicious expenditure of scholarship money, which should be restricted to honours students.

If the new university systems of this country are not, in the course of a few years, to take a subordinate position, and their degrees to sink into disrepute, if, in short, we are not to be left in the lurch by our foreign rivals, it becomes the duty of all who are responsible for the management of our provincial colleges and universities to have their attention aroused to a state of affairs which too often results in their professors being sweated and their students crammed.

GOVERNMENT GRANT IN AID OF ANTARCTIC EXPLORATION.

THE following letter, referring to a Parliamentary grant in aid of Antarctic exploration, has been received by Lord Lister from H.M. Treasury, and sent to us by the Secretaries of the Royal Society:—

Treasury Chambers, July 3, 1899.

MY LORD,—I am directed by the Lords Commissioners of Her Majesty's Treasury to inform you that the First Lord has laid before the Board the memorial signed by your Lordship as President of the Royal Society, by the President of the Royal Geographical Society, and by other distinguished representatives of various branches of science, by which memorial application is made for a Government grant in aid of the expedition now being organised by the Royal Society and the Royal Geographical Society for the exploration of the Antarctic regions. This application has received the careful consideration of Her Majesty's Government, and I am directed to inform you that they are prepared to ask Parliament for grants amounting, in all, to 45,000*l.*

towards the expenses of the proposed expedition, provided you are able to assure them that not less than an equal amount will be forthcoming from other sources, so as to enable the scheme to be efficiently carried out.

In making this announcement, I am to call attention to the latter part of the speech of the First Lord to the deputation which waited on him on this subject, as indicating that Her Majesty's Government must not be regarded, in making this promise, as inaugurating a new era of more extensive grants than formerly from the Exchequer in aid of scientific enterprises. Rather, it is to be understood that the very exceptional importance of the present scheme, so strongly represented by the deputation, is being recognised by the promise of a special grant.

At the present time, it is only necessary to add that the applications to Parliament for instalments of the grant will be spread over four years, of which 1900–1901 will be the first.

I am to ask you to be so good as to communicate this decision to the other signatories of the memorial.

I am, My Lord,

(Signed) FRANCIS MOWATT.

LORD LISTER,

President of the Royal Society,
Burlington House.

NOTES.

THE Paris Academy of Sciences has been authorised to increase its number of national and foreign Correspondants from 100 to 116.

THE *British Medical Journal* announces that Sir John Burdon Sanderson, Bart., and Prof. Michael Foster, K.C.B., will be entertained at dinner by British physiologists on July 20, to congratulate them on the honours recently conferred on them by the Queen. The dinner will take place at the "Star and Garter," Richmond.

THE Volta Centenary Exhibition at Como, described in NATURE of June 22, has been completely destroyed by a fire, attributed to the fusing of some electric wires. Practically all the precious Volta relics were lost in the flames, notwithstanding the precaution taken to preserve the objects by placing them in a receptacle of solid masonry. The only things saved were a sword of honour presented by Napoleon the First to Volta, a picture by Bertini of Volta explaining his battery to Napoleon, a cast of the great electrician's skull, his watch, and a few personal relics. Volta's books and manuscripts, some of which were recently bought by the Italian Government for 100,000 lire, his collection of batteries, the only authentic portrait of Volta, his will, &c., were all destroyed. In spite of the destruction of the Exhibition, the committee has decided that the *fêtes* in honour of Volta shall be continued. The International Congress of Electricians will be held as previously arranged.

PROF. EWART exhibited a number of his zebra hybrids, their dams, sire, and half-brothers and sisters, at the great Agricultural Show recently held in Edinburgh. The authorities were little prepared for the interest taken in the exhibit, with the result that many thousands either failed to see anything of the hybrids, or had but a passing glance. The Prince of Wales, accompanied by a deputation of the Royal Agricultural Society of England, made a special inspection of the mixed family. From a contemporary we learn the Prince was so greatly interested that he requested Prof. Ewart to make a similar exhibition next summer at the Royal Agricultural Societies' Show at York. Should breeders give up empirical in favour of scientific methods, not a

little of the credit will be due to the Prince of Wales recognising the importance of the investigations that have for some years been carried on by the Edinburgh Professor of Natural History.

AN international conference organised by the Royal Horticultural Society for the purpose of discussing "Hybridisation (the cross-breeding of species) and the cross-breeding of varieties" was opened on Tuesday. In opening the proceedings, Dr. Maxwell Masters gave an address on the history of the subject. Papers dealing with the experimental production of plant-hybrids and the scientific significance of the results were read by Mr. W. Bateson, F.R.S., Prof. H. de Vries, Prof. George Henslow, Prof. L. H. Bailey, and Mr. C. C. Hurst.

Science announces that Dr. Milton Updegraff, professor of astronomy in Missouri University, has been appointed, by President McKinley, professor of mathematics in the United States Naval Observatory.

WE learn from the Secretary of the Institution of Electrical Engineers that the reunion of the Institution in Switzerland, from September 1 to 10 next, is likely to be well attended, and that the final arrangements for the visit are now in progress. It is hoped that a circular giving further details may be issued at the end of the current month.

To commemorate the services which the late Mr. H. T. Soppitt rendered to mycological science and to Yorkshire natural history generally, efforts are being made to obtain funds to form a Soppitt memorial library of mycological literature, of which the nucleus should be Mr. Soppitt's own books and herbaria, which the widow and family are willing to part with for such a purpose. Such further funds subscribed as are not required for the purchase of these, are to be laid out in the purchase of mycological reference-books. The library when formed will be presented to the Yorkshire Naturalists' Union.

MR. H. H. HOWELL, who joined the Geological Survey under De la Beche in 1850, retires from the service to-day. Mr. Howell, after surveying some portions of Wales and the south of Scotland, and large areas in the midland counties of England, became District Surveyor of the north-eastern counties of England in 1872, he was appointed Director for Scotland in 1882 (when Sir Archibald Geikie became Director General), and he was further promoted to be Director for Great Britain in 1888.

MR. ERNEST E. L. DIXON, who has for the past two years acted as assistant to Prof. Judd at the Royal College of Science, has been appointed an Assistant Geologist on the Geological Survey of England.

THE annual meeting of the Society of Chemical Industry commenced yesterday at Newcastle-upon-Tyne. In his presidential address, Mr. George Beilby dealt with the question of fuel and smoke. The magnitude of this problem may be judged from the fact that the total coal consumed in the United Kingdom in 1898 was 157 million tons, of which 76 million tons were consumed for the production of power for industrial purposes, 46 million for the production of heat for industrial purposes, and 35 million for the production of heat for domestic purposes. The various remedies which have been suggested to reduce this consumption by using coal more economically are (1) improved appliances for the combustion of raw coal, and distribution of the air supply in furnaces; (2) the transformation of the raw coal into smokeless fuel by preliminary treatment, either by destructive distillation in gas retorts or in coke ovens, or by its conversion into fuel gas by partial combustion in air and steam. Mr. Beilby considered these remedies, and

concluded by suggesting that, as a means of bringing all of the different interests which are concerned in this matter into line, the Society should arrange for the holding of a conference on the subject of fuel and smoke, at which the leading technical societies, as well as the actual industries concerned, should be fully represented.—Prof. C. F. Chandler, of New York, was elected president of the Society in succession to Mr. Beilby.

THE death is announced of Sir Alexander Armstrong, K.C.B., author of "A personal narrative of the discovery of the North-West passage" (1857) and "Observations on Naval Hygiene, particularly in connection with Polar service," at the age of eighty-one. From the *Times* we learn that in 1849 the deceased was appointed surgeon and naturalist to Her Majesty's ship *Investigator*, under the command of Captain (afterwards Sir Robert) McClure, which sailed from Plymouth on January 20, 1850, for the Polar Sea in search of Sir John Franklin. After encountering many difficulties, the *Investigator*, in September 1851, was forced into a bay which Captain McClure named Mery Bay. Here both officers and men suffered great hardship and privation, the food being reduced during the second winter to two-thirds of its original quantity, and the sickness increasing to a great extent, when they were rescued from their perilous position by Lieut. Bedford Pim. In the previous April, Captain McClure had taken a party from the ship and, crossing the strait, reached Melville Island, where he left notice in a cairn that the *Investigator* was icebound off Bank's Island. This notice was discovered by a travelling party from Her Majesty's ship *Resolute*, under Captain Kellett, who were stationed off Melville for their winter quarters. It was then that Lieut. Pim volunteered to go in search of the ship, which he reached on April 6, 1853, after a journey of 160 miles, which occupied him twenty-eight days. The *Investigator* was then abandoned, and the officers and crew were transferred to the *Resolute*; but, owing to that vessel being unable to get to the eastward, they were compelled to pass another winter—the fourth—in the ice. Eventually they were transferred to the *North Star*, and reached England on September 28, 1854. By this expedition the existence of a north-west passage was fully established. Sir Alexander Armstrong was appointed Director-General of the Medical Department of the Navy in 1869, and retired from that office in 1880.

AN account of some simple experiments on the best forms of curves for use with gliding or soaring machines for artificial flight has been sent to us by Mr. A. A. Merrill, of the Boston Aeronautical Society, U.S.A. A bicycle wheel was arranged to revolve in a vertical plane upon an axle fastened in a pier. From a point on the wheel a rod projected, and at the end of the rod the surface to be experimented upon was fixed at an observed angle with the plane of revolution of the wheel. The wheel was then started by the fall of a weight joined to the wheel in such a way that when the weight had fallen through a certain distance it became disconnected. After a surface had been fastened to the rod, the wheel was started, and when it had stopped the number of revolutions it had made was shown by a mechanical recorder. Given the same starting force, the number of revolutions would evidently depend upon the facility with which the surface moved through the air. The surface which offered the least resistance to motion was thus obtained. Among other results, the experiments seem to confirm Mr. L. Hargrave's statement that the existence of a wind vortex under a bird's wing is an important factor in soaring.

A SATISFACTORY report of the committee of the Albany Museum, Cape of Good Hope, for the year 1898, has been issued. While special attention has been given to the development of the South African collections, a number of specimens

of general interest have been acquired from foreign countries. Dr. S. Schönland, director of the museum, reports that the kitchen-middens near Port Alfred have again yielded a number of interesting specimens. Amongst them were portions of skulls of some human beings (which still await a careful examination) and a number of animal bones, amongst which was the lower jaw of the Vlakke Vark (*Phacochoerus aethiopicus*). This animal is quite extinct in Cape Colony now, and it was not previously known that it had occurred at all in that neighbourhood. Dr. Schönland has been able to get some light thrown on a question concerning the pottery found in these middens, which has hitherto puzzled many ethnologists. More or less large pieces of pottery, with holes neatly drilled through them, have frequently been found; and the meaning of these holes has hitherto been unexplained. It now appears that these pots with holes were used as miniature kilns, technically known as "saggers" (in which smaller pots were burned), and the need of holes through them becomes obvious when the use of these pots is known.

IN his introductory lecture, Prof. J. A. Thomson, the newly-appointed Regius Professor of Natural History in the University of Aberdeen, gives utterance to a note of warning as to the direction in which our biological studies are tending. "Amid the undoubted and surely legitimate fascinations of dissection and osteology, of section-cutting and histology, of physiological chemistry and physiological physics, of embryology and fossil-hunting, and the like, do we not need to be reminded sometimes that the chief end of our study is a better understanding of living creatures in their natural surroundings?" He even goes so far as to say that it is difficult to see any reason for adding aimlessly to the already overwhelming mass of morphological and systematic detail. And that what we should rather aim at is the understanding of the chief laws of organic architecture, of the certainties and possibilities of blood-relationship among living creatures, and a true conception of what is meant by the term organisation. As has been pointed out elsewhere by Prof. Alfred Newton, such a warning is undoubtedly needed at the present day, when there is far too great a tendency to regard the description of mere structure as the ultimate end of biological research. It is as if some person to whom modern telegraphy were unknown were to describe in great detail the mechanics of the various instruments employed therein without the vaguest conception of their practical use.

THE inexplicable habit of snails occasionally abandoning their shells is again alluded to in the July number of the *Journal of Conchology*. A former instance recorded was that of pond-snails (*Limnea*), but this time it is land-snails (*Helix*) captured at Venice. Here is a case in point illustrative of what is said above—the fact is all very well in its way, but is of no real interest unless we know the reason for such a strange perversity of habit.

THE most generally interesting article in the June number of the *American Naturalist* is one by Prof. Sylvester Judd on the efficiency of some of the protective adaptations of insects in securing their safety from foes. As the conclusions are chiefly based upon the undigested contents of the stomachs of a very large number of birds, it will be obvious that the author has a definite set of facts with which to test the validity of theories—and the facts are by no means always in accord with the theories. Especially is this the case with insects presenting a presumed protective resemblance with the object or ground on which they rest. Grasshoppers, for instance, even when lying still and then most like their surroundings, are snapped up by numbers of birds; as are also the larvae of "looper" moths which resemble twigs, and likewise weevils. On the other hand, hairs, like those of many caterpillars, and, to a minor extent, the stings of

bees and wasps, appear to be much more efficacious for protection. The brilliant colours of lady-birds seem likewise highly protective. "Warning colours" are, however, by no means always effective in this respect; and pungent odours and acid juices (which may be more suited to avian than to human palates) often also fail to save the insects in which they occur.

THE detailed studies that are now being made of the religious ceremonies of various native tribes of North America by trained American anthropologists are worthy of special study by all students of Comparative Religion. It is now possible, as Dr. J. Walter Fewkes points out in his account of "The winter solstice altars at Hano Pueblo" (*American Anthropologist*, n.s., i. p. 251), to trace the effect of one cult upon another in mixed populations. Walpi, for example, commenced as a settlement of Snake clans which had united first with the Bear phratry and subsequently with other phratries of lesser importance. The purport of the winter solstice (*Tuñtai*) rites at Hano is to draw back the sun in its southern declination and to fertilise the corn and other seeds, and to increase all worldly possessions. As at Walpi, strings with attached feathers are made and given to men and women with wishes that the gods may bring them blessings. These strings are also attached to beams of houses, placed in springs of water, tied to tails of horses, burros, sheep, dogs, chickens, and indeed every possession which the Indian has and wishes to increase.

THE experimental psychologists have passed from testing senses to experimenting on sensations, and "The Emotion of Joy" forms the subject of a monograph, by Dr. G. Van Ness Dearborn, in *The Psychological Review*, vol. ii., 1899. The first series of experiments consisted in recording what the subject said he felt like doing, or would probably do under the accession of hypothetical gifts of ten, one hundred, one thousand, ten thousand and one hundred thousand dollars respectively. The more practical experiments consisted in noting unconscious muscular movements during pleasant or unpleasant conditions of sound, light, smell, &c. It was found that somewhat in proportion to its proper pleasantness, an emotional extramotion consists in expansiveness and outwardly in contraction of extensor muscles; this is true of the smile and laugh of joy. Contraction of the extensor muscles is more pleasant in itself than contraction flexors; there is a general tendency to flexion under a (naturally unpleasant) sudden shock.

IN recent years several authors have published expositions of the methods originated by Hansen in dynamical astronomy; the text-books on lunar theory chiefly used in this country—Brown's "Lunar Theory," and the third volume of Tisserand's "Mécanique Céleste"—each devote a chapter to the subject. As the ephemerides of the moon given in the *Nautical Almanac* and the *Connaissance des Temps* are still calculated from Hansen's tables, as corrected by Newcomb, the theory cannot be neglected by astronomers; though in the hopes of mathematicians it has been somewhat displaced by the more fascinating work of living writers. In a memoir (*Ueber die Differentialgleichungen der Mondbewegung*), reprinted from the *Transactions* of the Leipzig Academy, Dr. Scheibner (who we believe is a former pupil of Hansen) develops systematically the numerous and complicated equations which form the basis of Hansen's theory of the moon's motion. The memoir will doubtless be welcome to those German students who have felt the need of something in their own language intermediate in character between the brief account given in Herz's article in the "Handwörterbuch der Astronomie," and Hansen's own exposition in the *Darlegung*.

"SOME Glacial Wash-plains of Southern New England" is the title of an essay by Mr. J. B. Woodworth (*Bulletin* of the

Essex Institute, Salem, vol. xxix.). These "wash-plains" or stream deltas and fans constitute a very important feature in the Pleistocene deposits of the region. They form the lowlands on which the greater number of towns and villages are built. To the early settler, they offered flat ground free from the boulders which are strewn over the uplands; and they yield vast stores of gravel and sand in fairly definite positions. Representing the morainal deposits of a retreating ice-lobe, they comprise the materials spread out at successive stages by streams and rivers which issued from the ice; and these deposits vary according to their original relations to the frozen mass. Hence the coarse gravels and the finest sands may be looked for in particular areas. No definite relations to sea-level are found among the various wash-plains. It is noticed that temporary lakes were at times produced by the local presence of blocks of ice; and it is pointed out that the retreat of the ice from the area was so recent that the general form of the deposits and most of their details remain unaltered. Owing, however, to the decay of some of the basaltic and other stones, the surface of the ground has been somewhat lowered.

HERR A. WEIGEL, of Leipzig, has acquired the last two remaining copies of Kützing's *Tabulae Phycologicae*, in 19 vols., with 1900 coloured plates, which he offers for sale at 2400 m. (Kützing's own copy) and 2000 m. respectively.

MESSRS. DULAU AND CO., of Soho Square, have issued a catalogue of botanical works, consisting entirely of works on Phanerogamia, which are arranged alphabetically in their natural orders. The same firm forwards also a catalogue of books and papers on British botany.

Bulletin 168 of the Cornell University Agricultural Experiment Station is devoted to an account, by Prof. G. F. Atkinson, of three species of Fungi which he regards as valuable from an esculent point of view, *Coprinus comatus*, *C. atramentarius*, and *C. micaceus*, with abundant illustrations.

DR. F. SCHLEICHERT has an interesting note, in a recent number of the *Naturwissenschaftliche Wochenschrift* (June 25) on the observation of phenomena of vegetable physiology in the winter. Many of them, especially those connected with the supply of nutrition, may be followed nearly equally well at that period of the year as in summer.

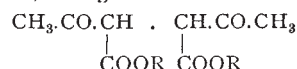
DR. L. O. HOWARD has published an account of the principal insects affecting the tobacco-plant in America in the *Year-book* of the Department of Agriculture for 1898. Although the plant is said to have no enemies peculiar to itself, it suffers from the attacks of many omnivorous *Lepidoptera*, especially Sphinges and Noctuae; and from those of various *Coleoptera*, *Hemiptera*, &c.

WE have received parts 10-12 (published in 1898) of the second volume of a journal called *Lavoura*, published by the National Society of Agriculture of Brazil. Among the miscellaneous contents which fill the magazine, we find a coloured plate of the imago and pupa of a butterfly (*Heliconius eucrate*, Hübn.); illustrated articles on a formidable internal parasite (*Anchylostoma*), and on the history of the wheat-plant; a portrait of the late Prof. Aimé Girard; notices and figures of *Eleusina coracano* and *indica* (forage-plants); and much agricultural and statistical information, primarily, of course, of local interest.

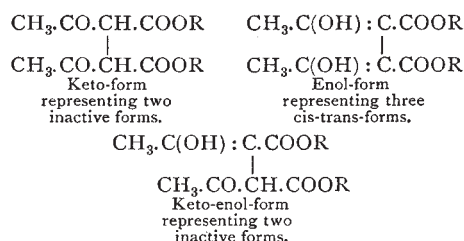
THE first number of *Le Mois scientifique et industriel*—a monthly synopsis of scientific information—has been received. To some extent, the new periodical resembles *Science Abstracts*, but it contains more abstracts of engineering papers, and less of scientific investigations. The abstracts are concise, comprehen-

sive as regards nationality, and well printed; they should, therefore, be of real service to French readers interested in the progress of pure and applied science.

A CAREFUL investigation of tautomeric compounds, *i.e.* substances which react as though each possessed more than one molecular structure, though only represented by *one* substance, has revealed in a few cases the actual existence of the different structural forms. A very interesting example is furnished by diacetylsuccinic ester, which has lately been studied by Prof. Knorr. At the time of its discovery it was regarded as a single distinct individual, having the formula



According to Knorr the presence of the other structural isomers has been overlooked from the fact that, though not the most stable relatively, the original compound has the highest melting point, and, being the least soluble, has crystallised most readily from solution. Knorr predicted some time ago the existence of seven isomeric compounds, not including optically active forms, and of these he has already succeeded in preparing five, whilst he considers it very probable that the two missing members will be found. These will be represented by the following formulæ:—



A RECENT issue of the *Transactions* of the Oxford University Junior Scientific Club contains a valuable account, by Mr. A. F. Walden, of the condition of dissolved substances in solutions other than aqueous. The experiments of Carrara have shown that solutions in methyl alcohol exhibit a progressive ionisation, and that the independence of the ions is as clearly marked as in the case of aqueous solutions. Tessarin has also shown that the molecular lowering of the freezing point of formic acid brought about by the chlorides and bromides of the alkali metals is abnormally high, showing that this solvent also behaves like water. Recent experiments by Franklin and Kraus have shown that liquid ammonia acts as a dissociating solvent. In reference to the hypothesis of Nernst that the dissociating influence of a solvent is related to its dielectric capacity, it is to be remarked that the dielectric constants of water, methyl alcohol, acetone, formic acid, and ammonia are all high. It is pointed out also that these solvents, with the possible exception of acetone, are characterised by having "associated" molecules. On the whole, therefore, it may be said that the phenomena which it is attempted to represent by the hypothesis of electrolytic dissociation are not peculiar to aqueous solutions. They are, so far as experimental evidence is available, found to be characteristic of solutions of salts in other solvents possessing high dielectric capacities and complex or associated liquid molecules. According to Thwing, the dielectric capacity is both an additive and a constitutive property. It increases as the temperature is lowered. The factor of association, according to Ramsay and Shields, also increases as the temperature is lowered. These facts have all to be considered in dealing with solutions and in comparing ionisation determinations made by different methods. Thus we have some explanation of the observation that the degree of ionisation of metallic salts dissolved in methyl or ethyl alcohol is uniformly less when estimated by the boiling point method

than when measured by the determination of electrical conductivity at a lower temperature.

THE additions to the Zoological Society's Gardens during the past week include a Macaque Monkey (*Macacus cynomolgus*) from India, presented by Mr. J. H. Higgins; two Maholi Galagos (*Galago maholi*) from South Africa, presented by the Hon. Gilbert Johnstone; two Common Badgers (*Meles taxus*), British, presented by Mr. A. Gorham; a Spring-bok (*Gazella euchores*, ♂), a Ring-hals Snake (*Sepedon haemachates*) from South Africa, four Spur-winged Geese (*Plectropterus gambensis*) from West Africa, presented by Mr. J. E. Matcham; two Lanner Falcons (*Falco lanarius*) European, presented by Sir H. H. Johnston, K.C.B.; a Yellow-fronted Amazon (*Chrysotis ochrocephala*) from Guiana, presented by Mrs. G. F. Cote; a Hunting Crow (*Cissa venatoria*) from India, a Black-necked Grackle (*Graculipica nigricollis*) from China, a Larger Rocket-tailed Drongo (*Dissemurus paradiseus*) from India, a Sacred Kingfisher (*Halcyon sancta*) from Australia, a Black Hangnest (*Cassidix orizivora*) from the Amazons, two Blackbirds (*Turdus merula*), European; a Brown Thrush (*Turdus leucomelas*) from South America, presented by Mr. Russell Humphreys; an Arabian Baboon (*Cynocephalus hamadryas*) from Arabia, three Barbary Partridges (*Caccabis petrosa*) from North Africa, three Western Pintailed Sand-Grouse (*Pterocles pyrenaica*), South European, a Grand Galago (*Galago crassicaudata*) from East Africa, three Black-headed Terrapins (*Damonia reevesi-unicolor*), three Reeve's Terrapins (*Damonia reevesi*) from China, a Home's Cinixys (*Cinixys homeana*), a Derbian Sternothera (*Sternotherus derbianus*) from West Africa, three Reticulated Pythons (*Python reticulatus*) from the East Indies, deposited; four Crested Pigeons (*Ocyphaps lophotes*) from Australia, an Ostrich (*Struthio camelus*, ♂) from Senegal, a Sun Bittern (*Eurypyga helias*) from South America, a Scarlet Ibis (*Eudocinus ruber*) from Pará, purchased; a Japanese Deer (*Cervus sika*, ♂), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

COMET 1899 *a* (SWIFT).—

Ephemeris for 12h. Berlin Mean Time.

1899.		R.A.	Decl.	Br.
		h. m. s.		
July	13	14 13 3	+ 13 50.7	0.06
	15	12 26	12 59.9	
	17	12 1	12 12.1	
	19	11 45	11 26.9	0.05
	21	11 36	10 44.1	
	23	11 34	10 3.6	0.04
	25	11 40	9 25.1	
	27	11 53	8 48.3	
	29	12 10	8 13.3	0.03
	31	12 32	7 39.7	
August	2	14 12 59	+ 7 7.6	

TEMPEL'S COMET 1899 *c* (1873 II.).

Ephemeris for 12h. Paris Mean Time.

1899.		R.A.	Decl.	Br.
		h. m. s.		
July	13	20 31 7.6	- 14 25.22	
	14	32 20.5	14 55.18	
	15	33 33.2	15 25.46	3.418
	16	34 45.7	15 56.42	
	17	35 58.0	16 28.5	
	18	37 10.2	16 59.51	
	19	38 22.3	17 31.59	3.566
	20	39 34.3	- 18 4.26	

The comet is still on the borders of Sagittarius and Capricornus, about 3° west of *a* and *β* Capricorni. M. L. Schulhoff points out in *Ast. Nach.* (No. 3574) that it is important to secure as many accurate observations of the comet as possible

at observatories of different latitudes during this apparition, as by this means our knowledge of the mass of Jupiter may be considerably improved.

THE NEW ALLEGHENY OBSERVATORY.—A little over a year ago Mr. J. A. Brashear inaugurated a movement to provide for the erection of a new building and an adequate instrumental equipment for the Allegheny Observatory, and the fund, from numerous subscriptions received, has grown to such proportions that the plan shows every sign of success. Prof. F. L. O. Wadsworth, until recently a member of the staff of the Yerkes Observatory, has been appointed to the directorship, and the plans for the new building have been prepared by him. The largest instrument is to be a refracting telescope of 30 inches aperture, with object-glass by Brashear, and special provision is to be made for astrophysical investigations, which will form the principal work of the observatory.

LEEDS ASTRONOMICAL SOCIETY.—The *Journal and Transactions* for the year 1898, lately issued, maintains the excellent standard of former years. Among the many interesting papers mention may be made of "The movements of the moon," "Star temples in Egypt," "Astronomy as applied to navigation." The volume contains two plates, one showing four drawings of Jupiter and one of Saturn made by Mr. H. J. Townshend, and the other a portrait of Mr. T. J. Moore, who has charge of one of the micrometers from the Oxford Observatory, with which he is engaged in measuring the plates for the Astrographic Catalogue. Accompanying this is a very lucid description of the work and scope of the Astrographic Survey, by Mr. Moore.

THEORY OF THE MOTION OF THE MOON.¹

THE second part of Dr. Brown's "Lunar Theory" contains the calculation of the terms of the third order in the eccentricities, inclination and ratio of the parallaxes. The first part (reviewed in NATURE, November 25, 1897) had already dealt with the general theory, the variation, and the terms of the first and second orders. It will be remembered that the differential equations to be solved are

$$(D+m)^2u + \frac{1}{2}m^2u + \frac{3}{2}m^2s - \frac{ku}{(us+z^2)^{\frac{3}{2}}} = -\frac{\partial \Omega_1}{\partial s}$$

$$(D-m)^2s + \frac{1}{2}m^2s + \frac{3}{2}m^2u - \frac{ks}{(us+z^2)^{\frac{3}{2}}} = -\frac{\partial \Omega_1}{\partial u}$$

$$(D^2-m^2)z - \frac{kz}{(us+z^2)^{\frac{3}{2}}} = -\frac{1}{2}\frac{\partial \Omega_1}{\partial z}$$

The notation is sufficiently familiar to render explanation unnecessary.

Dr. Brown's procedure is as follows:—Let

$$u = u_0 + u_\mu + u_\lambda, \quad z = z_\mu + z_\lambda$$

where u_0 denotes the variational terms

$$u_\mu, z_\mu$$

the terms of the orders already calculated

$$u_\lambda, z_\lambda$$

the terms of the next order to be calculated.

Then expanding by Taylor's theorem the unknown terms enter in the form

$$\zeta^{-1}(D+m)^2u_\lambda + M\zeta^{-1}u_\lambda + N\zeta^{-1}z_\lambda,$$

and

$$D^2z_\lambda - 2Mz_\lambda,$$

M, N being functions of the known variational terms.

The unknown terms enter under the same form every time, but if a solution with indeterminate coefficients be assumed, the coefficients in the simultaneous equations that result will depend upon the period of the inequality under consideration, and therefore, from the point of view of numerical solution, entirely different nearly every time. All who have had the practical

¹ "Theory of the Motion of the Moon; containing a New Calculation of the Expressions for the Coordinates of the Moon in Terms of the Time." By Ernest W. Brown, M.A., Sc.D., F.R.S. (from the *Memoirs of the Royal Astronomical Society*, vol. liii.).